N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[\Rightarrow\] B
Pressure \[\Rightarrow\] Ulcer

**Multicausality**

Years smoking \[\Rightarrow\] Heart disease
High fat diet \[\Rightarrow\] Heart disease
Limited exercise \[\Rightarrow\] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• **Measure of accuracy of a study**

• **Examined with critique of the following dimensions:**
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?
- No
- Yes

Is the primary purpose examination of relationships?
- No
- Yes

Descriptive Design

Will the sample be studied as a single group?
- No
- Yes

Correlational Design

Quasi-Experimental Study

Will a randomly assigned control group be used?
- No
- Yes

Is the original sample randomly selected?
- No
- Yes

Experimental Study
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
    - Yes
      - Single unit of study

- Studying events partitioned across time?
  - No
    - Cross-sectional design
  - Yes
    - Longitudinal Study

- Repeated measures of each subject?
  - No
    - Trend Analysis
  - Yes
    - Case Study

Research Design

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Phenomenon of Interest

Variable 1

Variable 2

Variable 3

Variable 4

Description of Variable 1

Description of Variable 2

Description of Variable 3

Description of Variable 4

Interpretation of Meaning

Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

→ Describe

Comparison of Groups on Selected Variables

→ Interpretation of Meaning

→ Development of Hypotheses

Group II
{variables measured}

→ Describe
Selecting the Type of Correlational Design

Describe relationships between/among variables?

Predict relationships between/among variables?

Test theoretically proposed Relationships?

Descriptive correlational design

Predictive correlational design

Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable

Research Design
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

1. Control Group?
   - No
     - Pretest?
       - No
         - One-group post-test only design
       - Yes
         - Repeated Measures?
           - No
             - Strategy for Comparison
               - No
                 - Suggest Reevaluating design
               - Yes
                 - One group pretest/post-test design
           - Yes
             - Compare treatment & control conditions?
Selecting The Type of Experimental Design

- Pretest
  - No: Post-test only control group design
  - Yes: Repeated Measurements?
    - No: Examine effects of confounding variables?
      - No: Pretest/post-test control group design
      - Yes: Multiple sites?
        - No: Randomized clinical trials
        - Yes: Blocking?
          - No: Comparison of multiple levels of treatment
            - No: Examination of complex relationships among variables in relation to treatment
            - Yes: Nested Designs
          - Yes: Randomized Block Design
Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:**
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:**
- Restricted generalizability as control increases
## Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of independent variables</th>
<th>Treatment</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
### Nested Design

<table>
<thead>
<tr>
<th>Pain Control Management</th>
<th>Primary Nursing Care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional care</strong></td>
<td><strong>Primary Care</strong></td>
</tr>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td><strong>PRN Medication</strong></td>
<td><strong>No Primary Care</strong></td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
<tr>
<td><strong>New approach:</strong></td>
<td></td>
</tr>
<tr>
<td>&quot;Around the clock&quot;</td>
<td></td>
</tr>
<tr>
<td>medication</td>
<td></td>
</tr>
</tbody>
</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design